THE IMPACT OF FINTECH ON PERFORMANCE AND EFFICIENCY OF FINANCIAL SERVICES PROVIDERS-EVIDENCES FROM INDIA

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DECLARATION BY THE SCHOLAR

I hereby declare that the short synopsis ***"The Impact of Fintech on Performance and Efficiency of Financial Services Providers-Evidences from India"*** being submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy in Department of ***Management and Commerce*** under School of ***Management and Commerce*** of Manav Rachna University, Faridabad during the academic year 2024-25.

It is a bona-fide record of original work carried out under the supervision of ***Dr. Shweta Goel*** has not been submitted in full or part to any other university or institute for degree or diploma.

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Further, it is certified that the short synopsis is within the plagiarism limit and copy of the same is attached as per the University norms.

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ABSTRACT

A financial system consists of various institutions at different levels that facilitate the flow of funds. Key components include banks, insurance companies, non-bank financial companies, government treasuries, stock exchanges, and financial markets, each playing a crucial role in managing and exchanging financial assets (Burke, 2021). The financial services such as banking, insurance, capital market and consumer credit etc. are growing in most economies. The researchers have deep interest in observing the various factors influencing these services (Farquhar & Meidan, 2017). The use of digital innovations such as the internet, smartphones, artificial intelligence, and blockchain (financial technology) etc. by these institutions could exploit profitability and achieve efficiency. Financial technology lays numerous benefits, including accessibility, convenience, cost-effectiveness, security, quick transfers, and transparency (Takeda & Ito, 2021). The preliminary study on existing literatures is silent on how financial technology influences the financial performance and market performance of financial services providers in India as well as other parts of the world. Also, there is a noticeable gap in the literature regarding the effects of financial technology on operating and technical efficiency. Very few research reports have been published on this theme in India as well as abroad, Therefore, the derived title is the impact of fintech on the performance and efficiency of financial services providers: evidences from India. The research will be done with the objective to find the impact of fintech on financial services providers encompassing four aspects including their financial performance, market performance, operating efficiency, and technical efficiency. Data will be collected from various secondary sources, including literature reviews, annual reports, and financial databases. the span of the study will be from April 1, 2008, to the present. The 'panel data regression model' for analysis will be used. There will utilisation of various software packages. The expected outcome of the research would contribute to the exiting literatures, decision making units, policy makers and other stakeholders in different ways. The proposed result is that there 'significant and positive impact of fintech on the financial, market, operating, and technical efficiency' of financial services providers.

Keywords: 'Financial Technology', 'Fintech', 'Financial Services Providers', 'Financial Performance', 'Market Performance', 'Operating Efficiency', 'Technical Efficiency'.

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1 INTRODUCTION

A financial system is a complex network of institutions, practices, and rules that facilitate the exchange of funds among various economic agents. These agents include borrowers, lenders, investors, and other participants in the economy. A financial system encompasses a wide range of institutions, both globally and at regional or firm-specific levels. These institutions play crucial roles in enabling the flow of funds.

The components of a financial system include: Banks: These institutions provide financial services such as accepting deposits, granting loans, and facilitating payments. Insurance Companies: They offer protection against risks by providing insurance policies. Non-Bank Financial Companies: These entities operate outside the traditional banking system and include pension funds, hedge funds, private equity firms, and investment trusts. Government Treasuries: Government agencies responsible for managing public finances. Stock Exchanges: These platforms allow the trading of stocks, bonds, and other securities. Financial Markets: These markets facilitate the exchange of financial assets (e.g., stocks, bonds, derivatives) among participants (Burke, 2021).

Financial services can have many components, especially when it comes to investment products. This complexity poses challenges in presenting these services to consumers. The intangibility of financial services understood by their lack of physical form and only elusive. Defining and understanding them can be difficult (Wright et al., 2010).

As the role of the financial services sector, especially banking, insurance, building societies, hire purchase, franchising, consumer credit, and general household financial services, continues to grow in most economies, it becomes crucial to manage these services effectively through strategies. Despite economic challenges, this sector's turnover and profits are on the rise, significantly impacting the overall economy. Consequently, there is a key interest in watching on various forces that influencing financial services (Farquhar & Meidan, 2017).

For a long time, traditional banks monopolized the global financial services sector. However, the advent of telecommunications and information technology has revolutionized this sector. This revolution has spawned a new breed of financial service providers, known as FinTech (now on FT) companies, that aim to reduce the costs of financial intermediation. Operating at the intersection of finance and technology, these FT companies leverage technological advancements to reduce transaction costs and mitigate information asymmetry.

FT, a term frequently used to describe the technological transformation of the finance world, encompasses new digital technologies and business models in finance. Despite the banking sector's historical reluctance to embrace new technologies (consider the adoption of ATMs and online banking), there has been a recent surge in technological change. This surge is attributed to a combination of new technologies impacting business models and increased regulations for banks.

The IMF has provided an overview of the impact of FT on financial services to date. This overview includes various services such as payments, savings, loans, risk management, and advice, comparing traditional methods with new FT solutions. It also assesses the anticipated impact of various technological innovations, rating them as high, medium, or low (Bilan et al., 2019). From the enormous studies and discussions, it is imperative to conduct research on the impact of fintech on financial services providers, which is worth doing.

1.1 **Need for the study and the research gap**

FT and other tech companies have developed innovative, cost-effective business models that enhance efficiency and provide safer, more secure services to consumers. The FinTech business model has begun to encroach upon core banking services and is now an alternative means of providing financial services. FT firms are continually improving in terms of quality and efficiency. Presently, financial institutions are either developing or acquiring FT capabilities, or entering into partnerships with FT companies. The new financial ecosystem encompasses payments, asset management, peer-to-peer lending, initial coin offerings, insurance, remittances, credit savings, and solutions for money laundering, among other things (Lee & Shin, 2018).

Innovative entrants in the financial sector are leveraging technology to address key issues and construct a new financial ecosystem. Financial Technology, or FinTech, integrates digital technologies such as the internet, smartphones, artificial intelligence, and blockchain to deliver financial services. The benefits of FT include convenience, cost-effectiveness, security, rapid international money transfers, and enhanced transparency. The conservative approach of traditional banks has contributed to the rise of FT, which offers numerous advantages (Takeda & Ito, 2021). FT is viewed as both a service and a technology.

The profitability i.e. returns on assets and equity of financial services providers (DeYoung et al., 2007; Onay et. al., 2013; Orji et al., 2018 and Mensah et al., 2019). But, Sathye (2005) asserted that financial innovation such as internet banking, does not significantly influence bank performance.

Innovations negate the need for customers to visit physical bank locations, thus reducing operational costs. The report advocates for banks to fully embrace mobile banking to not only create employment opportunities but also to expand their market share.

Gai & Kapadia (2019) have delved into the technical dimensions of FinTech, encompassing aspects such as data management, infrastructure and equipment development, security, privacy, and application design.

They highlight the shift of invoice platforms to online mediums, positioning FinTech as an alternative to traditional banking due to its flexibility, availability, speed, and transparency. They emphasize that mobile and payment technologies are fundamental to FinTech.

Mehrotra & Menon (2021) discuss the use of AI in FinTech for forecasting and decision-making processes. Emerging fields in FinTech include insurance, budgeting apps, mobile payments, robo-advising, equity trading apps, FinTech stocks, and crowdfunding platforms (Chen & Yoon, 2022). However, they also note that FinTech faces challenges such as the need for more regulatory clarity and trust.

A systematic search in databases placing fintech and extraction of components has been drawn. Functions of financial systems have been disused ten challenges to have a sustainable financial system (Karyotis & Onochie, 2016).

Six functions of the financial systems are dictated (Merton, 1995). The usefulness of fintech services has significant positive influences on their use (Al-Okaily et al., 2021). Factors affecting the mobile payment security model have been formulated (Hwang et al., 2021). Trends and challenges of fintech described (Mehrotra & Menon, 2021) Traditional financial services have been challenged by Digital innovation (Irimia-Diéguez et al., 2023).

Preliminary research has been conducted to find the research gap. The objective of the preliminary research was to identify and analyse the FT and its relationship with the other fields; find out components of FT and research themes, publications per year, types of documents, affiliations, the leading authors, influential countries, and prominent funding agencies, as well as to explore potential subject areas, employing bibliometric analysis in conjunction with innovative visualisation techniques. The most of research have been done on the topics such fintech (FT) and blockchain, banking, financial services, electronic money, regtech, Indonesia, digital technology, financial institutions, financial industry and commerce etc.

The figure1 given below depicts the research conducted on FT and its relationship with the other fields. Bibliometric analysis revealed that only 1579 documents were present on Scopus database on search with key of Fintech and financial technology on dated December 31, 2022.

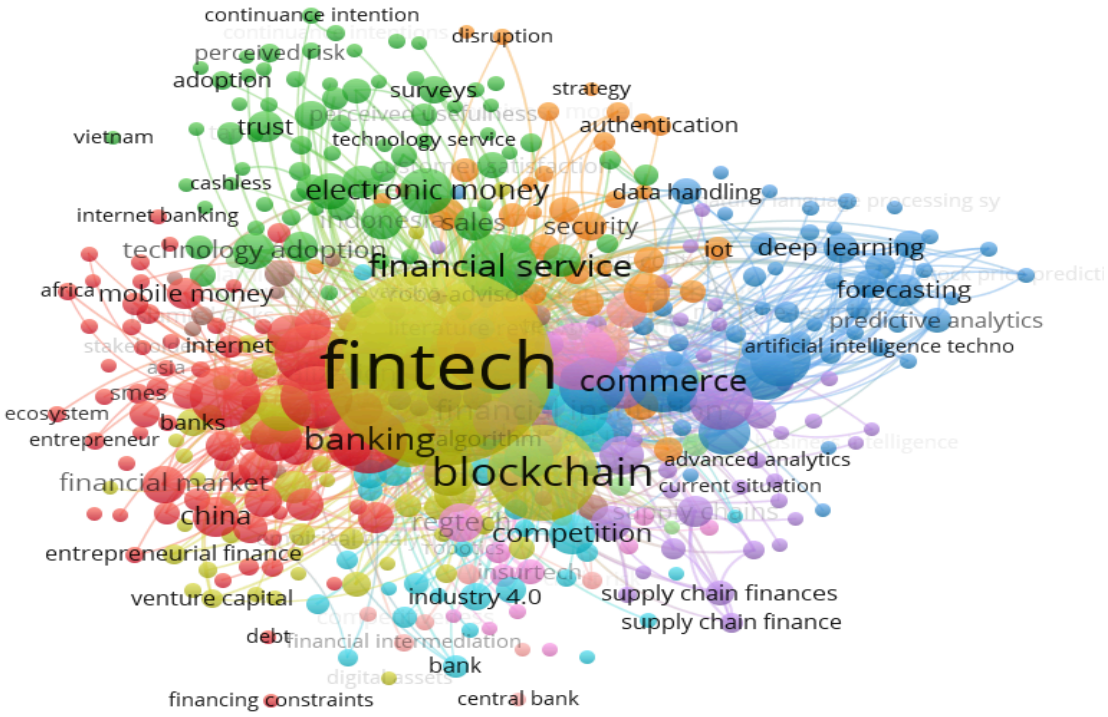

Figure 1 Fintech and area of research. Source(s): Authors' computation from Scopus data and use of VOSviewer

Most of the research has been done in the area of fintech and blockchain, commerce banking, financial services, mobile money, electronic money financial institutions etc.

Scrutinising the above picture, we fail to observe the keywords like financial performance and efficiency.

The next figure depicts the fintech and its components and other research topics. From this picture we can infer that peer-to-peer lending, financial innovation, digital transformation, blockchain, artificial intelligence, and digital payments, mobile payments are the important components of FT.

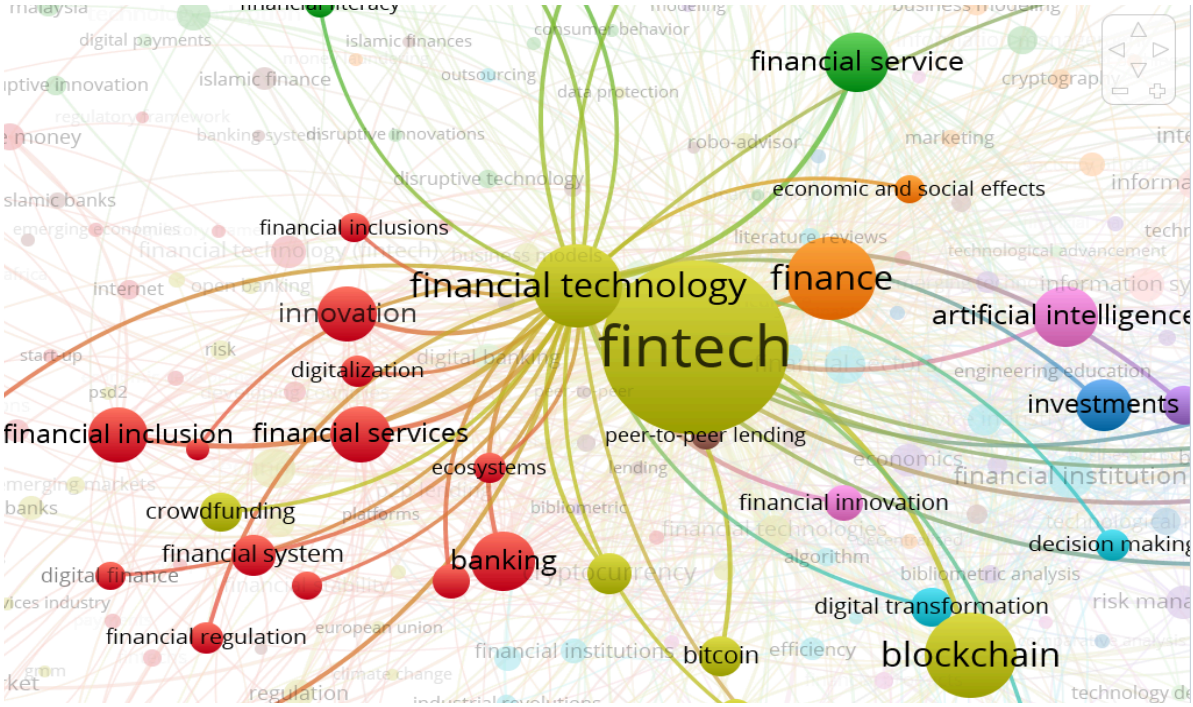

Figure 2 Fintech and its components, and other research themes. Source(s): Authors' computation from Scopus database and use of VOSviewer

The figure 3 depicts that there are imperceptible relationships between FT, financial services providers and the performance and efficiency. Also, no research has been done on fintech companies and banks or financial services or blockchain etc.

Despite the burgeoning interest in fintech from both real-world and academic perspectives, our collective understanding of its impact on the financial services providers remains quite limited. Encryption technologies have helped in the mitigation of the menace of financial fraud; hence, financial services providers benefitted the most, but the empirical study is limited. Other areas of research, as shown in the picture, are digital technologies, financial systems, and banking, where most of the research has been done.

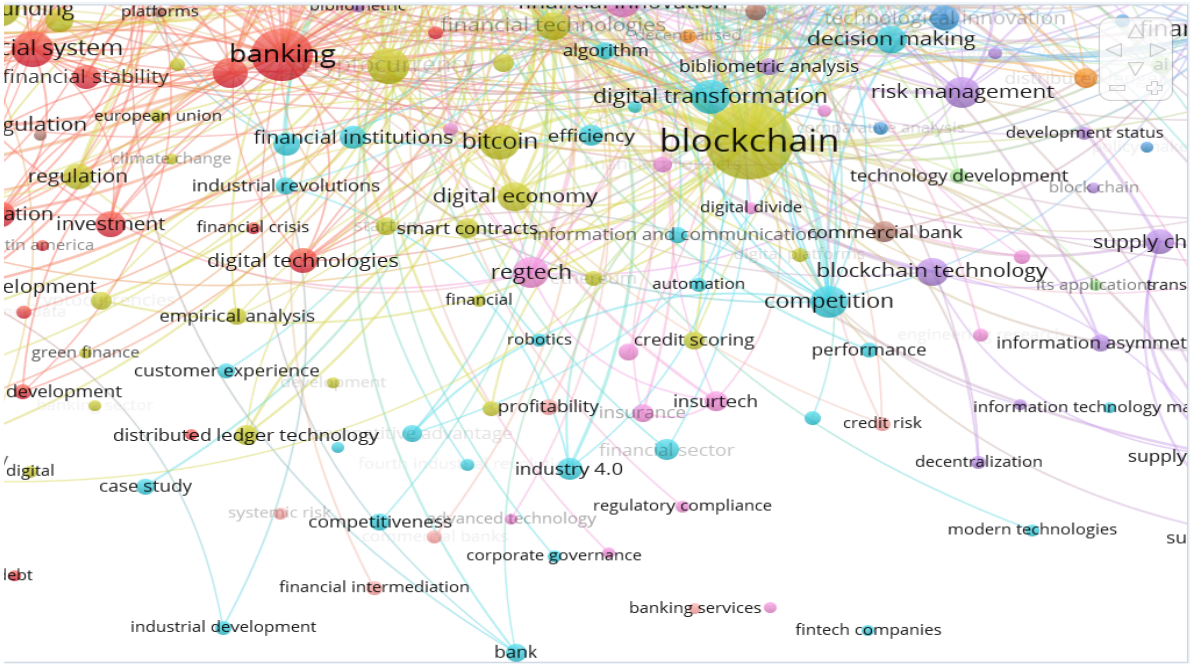

Figure 3 Fintech and Performance and efficiency and financial services providers. Source(s): Authors' computation from Scopus database and use of VOSviewer

A number of research has been done on blockchain, risk management, decision making digital transformations efficiencies, competition, digital economy, banking bitcoin, financial system, performance, regtech, supply chain etc. The research on FT, financial services providers and the performance and efficiency is imperceptible.

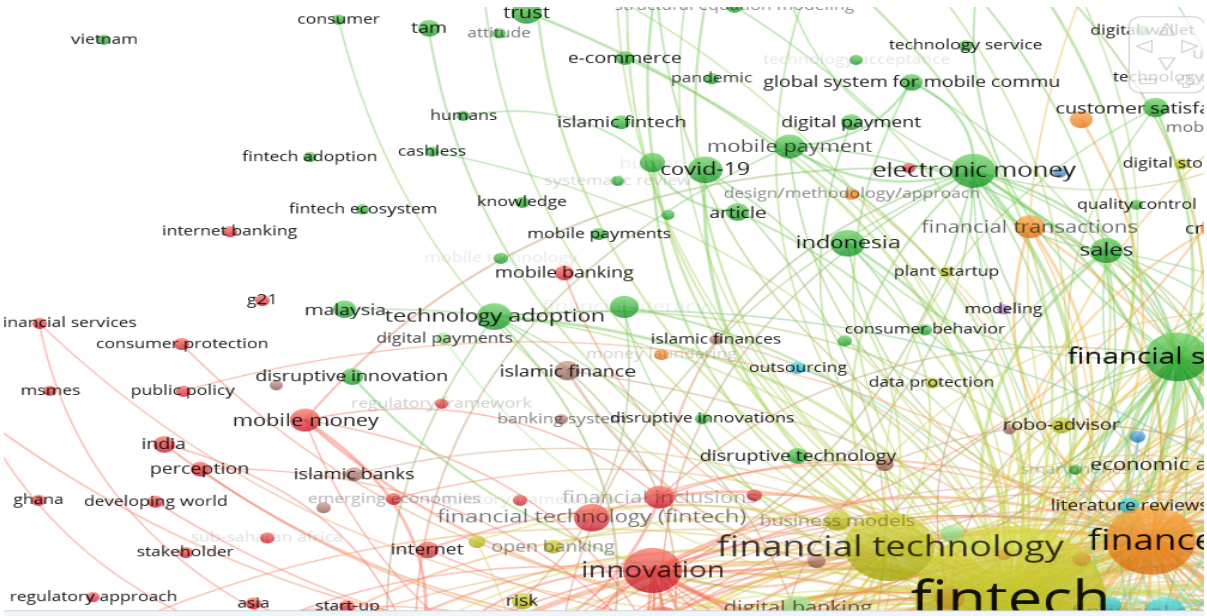

Figure 4 Fintech, mobile payment and financial services. Source(s): Authors' computation from Scopus database and use of VOSviewer

Figure shows the relations between fintech, mobile payments, and financial services. Narrowing done the topic through use of filters we got 577 documets only after limiting search to keywords financial technology, fintech, subject are business, economics, and social science. And limting article type documents, english language. The next figure depicts important of the topics, how it got populatity overperiod of time, infered from the publication per year from 2015 to 2023.

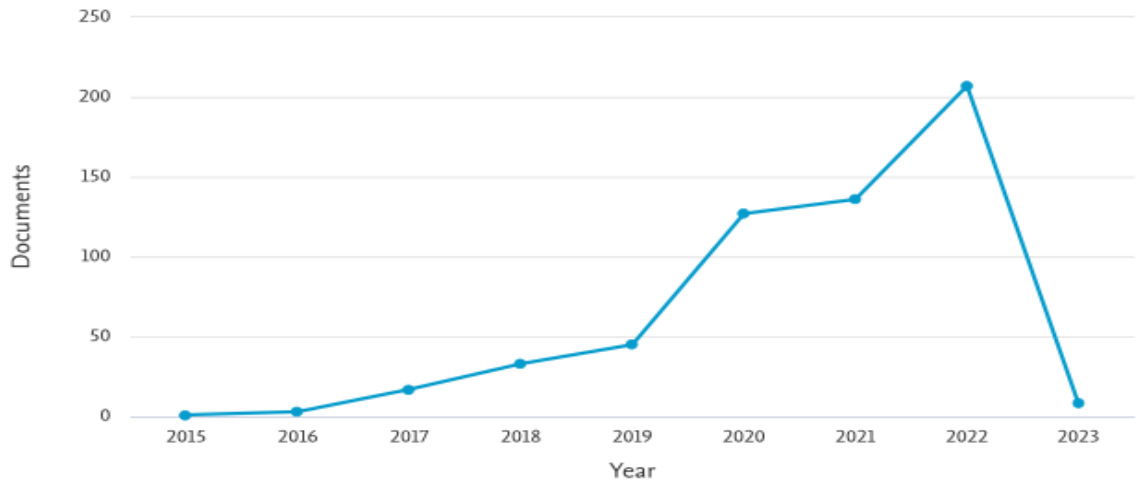

Figure 5 Publications by year. Source(s): Authors' computation from Scopus database.

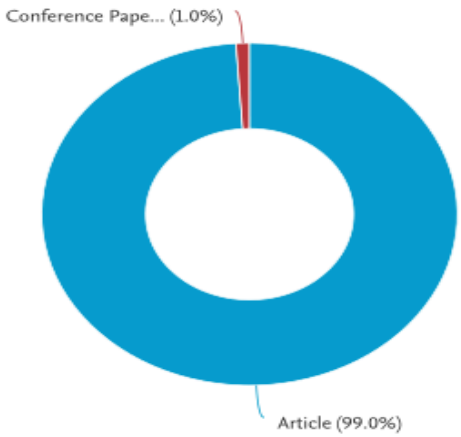

Figure 6 Publications by documents type. Source(s): Authors' computation from Scopus database.

The average number of citations per year is a metric used to evaluate the impact of a journal or an author's work annually. It is calculated by dividing the total number of citations by the number of years the author or journal has been publishing. Research in the field has increased exponentially since 2019. Most of the publication document type is articles, including 99% of total publications.

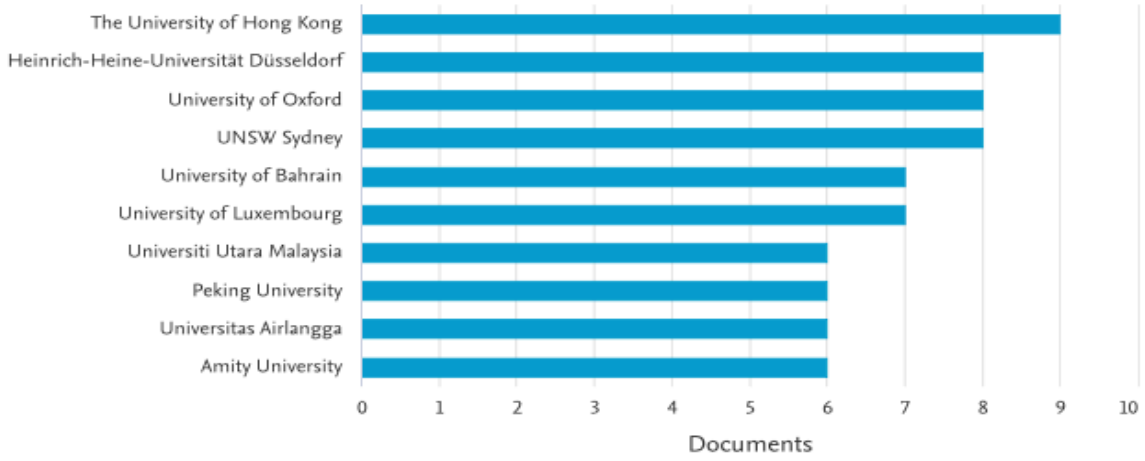

Figure 7 Publications of documents by affiliation. Source(s): Authors' computation from Scopus database.

The University of Hong Kong has nine publications, followed by the Heinrich Heine University in Düsseldorf, the University of Oxford, and UNSW Sydney, each with eight publications. Then the University of Bahrain and the University of Luxembourg each have 7 publications. University utara Malaysia, Peking university, Universitas Airlangga, and Amity University (Indian University) each of them has 6 publications.

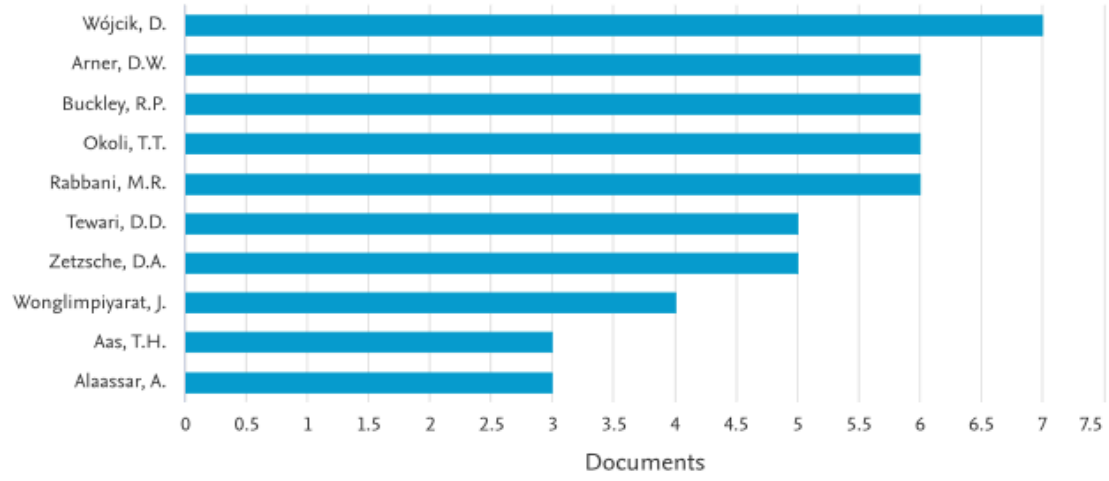

Figure 8 Publications of documents by Author. Source(s): Authors' computation from Scopus database.

Wojcik, D. has published seven in total. Followed by Arner, D. W., Buckley, R.P., Okoli, T.T., and Rabbani, M.R., each one of them has six research publications. Then Tewari, D.D.,

and Zetzsche, D.A. have 5 publications each. Wonglimpiyarat, J. has 4 research publications, and Aas, T.H., and Alaassar, A. each of them has 3 research publications.

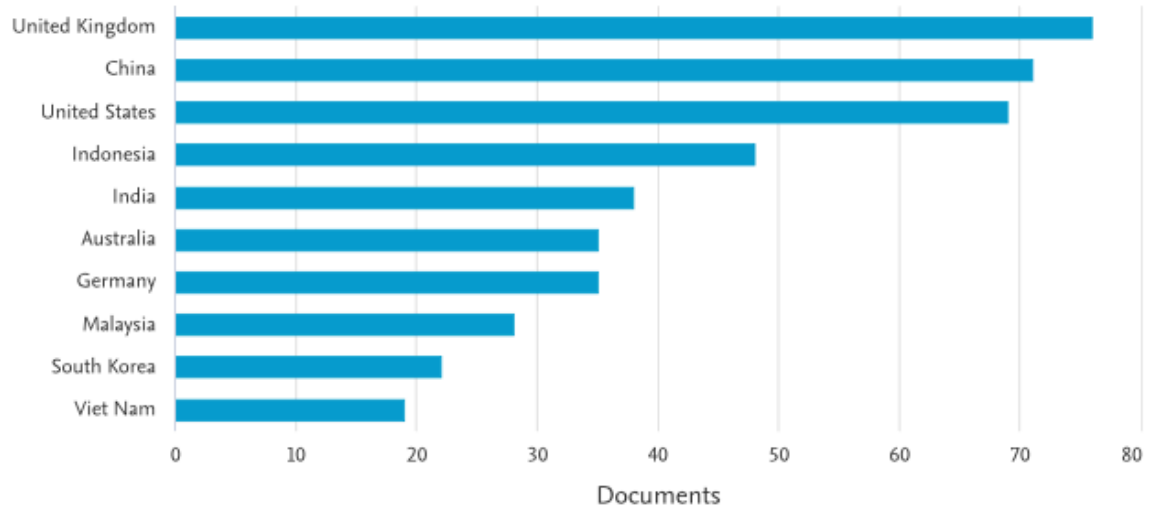

Figure 9 Publications of documents by Country. Source(s): Authors' computation from Scopus database.

The UK has the most publications and has more than 75 research papers, followed by China with more than 70 publications, the USA has around 70 publications, and Indonesia has around 50 publications; India has 38 publications only. Australia and Germany have 35 publications each. Malaysia, South Korea, and Vietnam have less than 30 publications each.

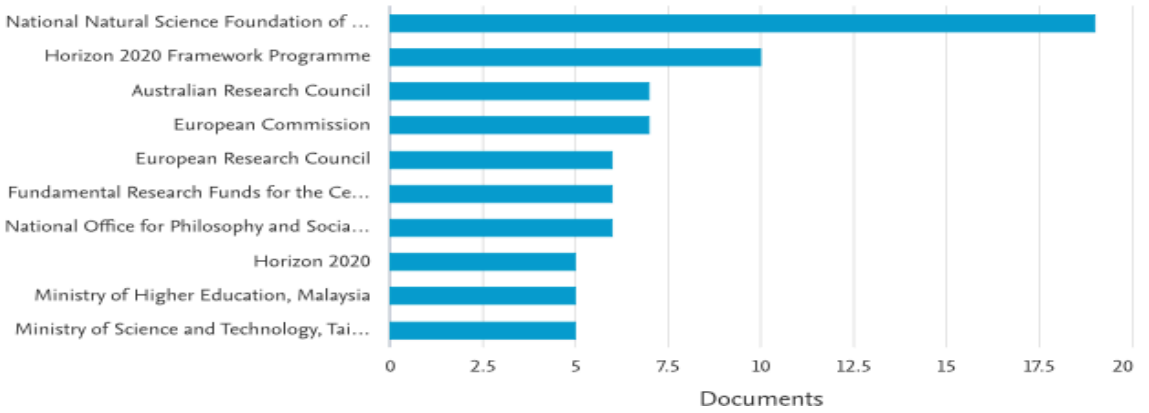

Figure 10 Publications of documents by Funding sponsor. Source(s): Authors' computation from Scopus database.

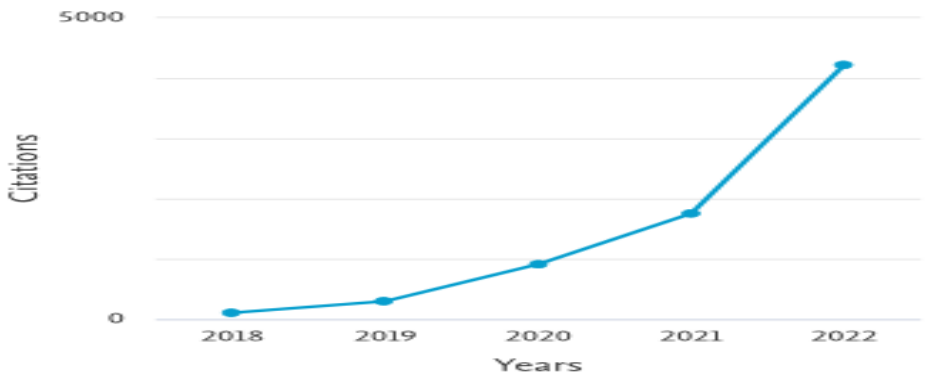

Figure 11 Citation per year. Source(s): Authors' computation from Scopus database.

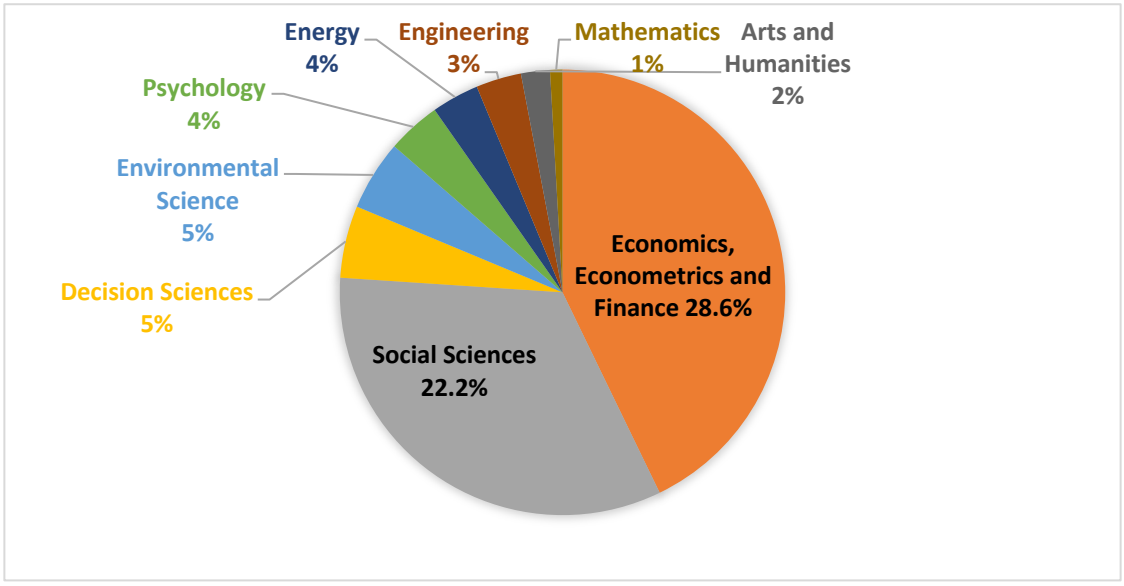

Figure 12 Publications of documents by subject area. Source(s): Authors' computation from Scopus database.

The National Natural Science Foundation of China is the funding sponsor followed by Horizon 2020 Framework Programme then Australian Research Council then European Commission then European Research Council and then Fundamental Research Funds for the Central Universities of Beijing University of Chemical Technology. Followed by National office for Philosophy and social sciences. Horizon 2020 Ministry of Higher Education, Malaysia Ministry of Science and Technology, Taiwan.

Form the Figure 11 it is clear that citation and popularity on the theme have grown over the period of time. Next Figure shows that 22.2% of publications have been done in the social science subject area.

To the best of my knowledge, discussions form preliminary bibliometric analysis, and existing research (discussed in a literature review) have not specifically addressed how FinTech influences financial services' performance, particularly in terms of financial and market performance of financial services providers. Furthermore, there appears to be a gap in literature regarding the effects of FinTech on operational aspects, especially concerning the operating efficiency and technical efficiency of financial services providers. Some studies have attempted to explore the impact of such technologies within financial institutions. However, research examining their effects across all firms remains limited. From the above preliminary study, it is evident that less than 40 documents published on the theme by India. Therefore, it is imperative for research from India.

Therefore, I propose the topic of my research as the impact of fintech on performance and efficiency of financial services providers-evidences from India.

The remainder of this synopsis is structured as follows: Section 2: Objectives of Research. Section 3: Literature Review. Section 4: Hypothesis. Section 5: Methodology to be Adopted. Section 6: Proposed/Expected outcome of the Research. Section 7: References.

2 OBJECTIVES OF RESEARCH

FinTech is transforming financial services by enhancing deposits, loans, fundraising, investments, insurance, leasing, risk assessment, payment clearing, trade finance, and financial advising through innovative technologies and improved customer experiences and so forth. To comprehensively assess the impact of financial technology on financial service providers, we have set the following objectives:

1. To find the impact of fintech on financial performance of financial services providers.

In this study financial performance will be gauged by return on assets and the Net interest margin_ and following will be the control variables: capital adequacy ratio, Size, Capitalization, Expense to total income, annual growth of deposits, Reserve to total assets. Total expense to total liability. Cash flow from operating activity_ to total assets, Cash flow from investing activity_, Cash flow from financing activity_. The second objective assesses the effect of fintech one market performance of such service providers and is as follows:

2. To find the impact of fintech on market performance of financial services providers.

This objective uses return, risk (variance and standard deviation). CAPM. Sharpe ratio. Treynor ratio. Tobin's Q ratio to assess the market performance. Operating efficiency for financial services providers means using resources wisely to get the best results with the least waste. This involves improving processes, reducing costs, and so on. Studying operating efficiency helps identify inefficiencies and improve control. Therefore, the next objective is to explore the relationship-between operating efficiency and FinTech. The objective is:

3. To find the impact of fintech on operating efficiency of financial services providers.

The operating efficiency can be gauzed by operating efficiency ratio, operating profitability ratio, return on capital employed, return on owner's equity. The final objective of this research is to determine whether fintech has impacted technical efficiency. Therefore, the fourth objective is:

4. To find the impact of fintech on technical efficiency of financial services providers.

Technical efficiency assessed by output-input ratio. The output price will be measured as price of investments, price of loans, and the input price will be measured as price of financial funds, price of labour, price of physical capital.

3 LITERATURE REVIEW

3.1 Financial performance of financial services providers and the fintech

FinTech is revolutionizing various aspects of financial services, including deposits, loans, fundraising, investments, insurance, leasing, risk assessment, payment clearing, trade finance, and financial advising. Financial services have been digitalized and tokenized, leading to a reduction in information asymmetry, elimination of intermediaries, decentralization of services, and improved security. FinTech firms are now primarily focused on providing financial services (Hendershott et al., 2021).

Several studies have explored the impact of FinTech on different facets of the real economy, such as income disparity between urban and rural areas, employment issues, and business innovation. However, the specific influence of FinTech on bank performance, including its effects on return on assets and interest income, remains an area for further investigation (Liu et al., 2024).

Financial services can be defined as 'activities, benefits and satisfactions, connected with the sale of money, that offer to users and customers, financial related value' Farquhar &

Meidan, 2017). The array of institutions offering financial services comprises banks, insurance companies, building societies, credit card issuers, investment trusts, stock exchanges, franchising and leasing companies, national savings and giro banks, unit trusts, and finance companies, among others.

Financial performance serves as a measurable gauge of a firm's efficiency in leveraging its assets to generate revenue from its core business activities. A metric is commonly employed to assess an organization's financial health with respect to time period. The primarily financial performance of an organization is good if it provides superior services to customers. Also, it is surged with its customer loyalty, for financial service providers it also fit true as well.

In alignment with a preceding study, Keisidou et al. (2013) analysed profitability metrics to gauge the financial performance of FSPs. They used of return on assets (now on ROA_), return on equity (now on ROE_), and net profit margin (now on NPM_) as dependent variables. Diverse approaches have been previously utilized to quantify financial performance. For example, Anderson et al. (1994) implemented return on investment (now on ROI_); Chi & Gursoy (2009) considered profitability, ROI_, and net profit; Hallowell (1996) utilized ROA_ and the ratio of non-interest expenses to total revenue. Other studies have incorporated a variety of accounting variables such as ROA_, ROE_, Deposits, and Revenues. Specifically, Nawaz (2019) applied ROA_ and ROE to evaluate the financial performance of banks in the UK.

Rashid et al. (2020) have done investigation into the nexus between customer loyalty and the financial outcomes of banks. It scrutinizes the influence of service quality on fostering customer allegiance. Data was amassed through a survey comprising 356 questionnaires distributed to clients of select Islamic banks in Bangladesh, aiming to capture insights on service quality and customer loyalty. Concurrently, financial performance metrics were extracted from the banks' annual reports. The study is anchored in the service quality model, which encompasses five service quality dimensions: tangibles, empathy, assurance, reliability, and responsiveness.

A suite of statistical methods, including exploratory factor analysis, reliability testing, and regression analysis, was employed to test the hypothesis. Empirical findings from the study reveal that service quality—specifically tangibles, empathy, reliability, and responsiveness—has a significantly positive effect on customer loyalty. Assurance, however, did not exhibit a meaningful correlation. Moreover, the research found no substantial link between customer loyalty and the financial performance of the Islamic banks in Bangladesh.

Researches indicate that financial innovations generally boost the profitability of deposit money banks in Nigeria, as evidenced by improved return on assets and equity. This aligns

with the findings of DeYoung et al. (2007); Onay and Ozsoz (2013); Orji et al. (2018), and Mensah et al. (2019). However, it contrasts with Sathye's (2005) assertion that financial innovation, specifically internet banking, does not significantly influence bank performance. Further studies, including recent ones on financial innovation, confirm its positive effect on bank performance over time. Therefore, it's imperative for Deposit Money Banks to adopt electronic-based application products. Such innovations negate the need for customers to visit physical bank locations, thus reducing operational costs. The report advocates for banks to fully embrace mobile banking to not only create employment opportunities but also to expand their market share. Enhancing security in regions yet to be penetrated by banking services is recommended (Ashiru et al., 2023).

The study's dependent variable was the financial performance (FP) of banks. Two indices were utilized to measure FP. The first index is the Return on Assets (ROA), which is a comprehensive indicator of bank profitability and has been widely used in prior research examining the relationship-between green credit and financial performance (Scholtens and Dam, 2007; Finger et al., 2018). The second index is the Net Interest Margin_ (NIM), defined as the ratio of net interest income to interest-bearing assets. Net interest income is a significant revenue source for commercial banks (Nguyen, 2012), and since green credit contributes to net interest income, NIM effectively measures green credit's direct impact on financial performance (Lian et al., 2022).

Bank performance is indicative not only of the social and economic progress and the populace's quality of life but also of the extent to which the financial sector and digital technology have converged. The integration level of banks and other financial institutions with digital technology can significantly influence their performance. The study investigates how a bank's performance impacts the innovative evolution of financial technology, as well as the continuous enhancement of social and economic development. Consequently, bank performance has been selected as an explanatory variable. ROE_ defined as the ratio of after-tax net profit to equity capital, is employed to gauge the actual performance level of banks, drawing on the research by Nguyen (2012) and Evian et al. (2021).

Financial technology represents the new wave of finance that goes hand-in-hand with the worldwide economic integration and the swift expansion of the digital economy. It mirrors the current trend of integrating digital and informational processes in the financial sector. The growth level of financial technology steers the innovation path and future prospects of financial institutions like banks. A higher degree of financial technology equates to more investment in the financial sector and a stronger capacity for innovation, which can influence the bank's

profits. The study done by Zhao et al. (2024) focuses on financial technology as the main variable to examine its effect on bank performance.

For measuring financial technology, their research uses the capability for third-party payments, with data mainly taken from the "China Third-party Payment Industry Research Report. Other variables were Urbanization Level, calculated as the ratio of the urban population to the total population; economic development level: measured by the logarithm of GDP per capita; tax burden level: determined by the ratio of the total tax paid by a company to its available financial resources; capital adequacy ratio (CAR): defined as the ratio of total net capital to total risk-weighted assets, considering the capital floor; bank net interest margin: Found by dividing the difference between the bank's interest income and expenses by all interest-earning assets; Bank Provisioning Ratio: The ratio of the Provisioning Balance to the Total Loans. The above studies revealed that the literature presents varied perspectives on the relationship-between financial technology and the financial performance of financial service providers. The very first objective of this study will put light on this. Therefore, the first hypothesis has been put forth:

H1: *fintech has significant and positive impact on the financial performance of financial services providers. (See the equation 1.)*

3.2 Market performance of financial services providers and the fintech

Puschmann (2017) posits that recent advancements in information technology have spearheaded process automation, inducing transformation in consumer behaviour, the financial ecosystem, and regulations. The term 'FinTech' was first coined in the 1990s by Citicorp's chairman, John Reeds, during a smart card forum (Puschmann, 2017). It represents financial innovation in processes, products, services, organizational structures, and business models.

A healthy and orderly financial system development is crucial for an organization's sustainability, contributing to economic growth, as evidenced in China. However, financial constraints pose significant challenges to a firm's growth, affecting its operating, investing, and financing activities (Chen & Yoon, 2022).

A study on Investment performance comparison of portfolio selection strategies in stock market has been done by Hung et al. (2024). They analysed eight different stock portfolio strategies in Taiwan's market, using data from the top 100 companies by size from 1990 to 2021. They ignored the simplest strategies and focused on six others based on various financial

theories. They measured how well these stock portfolios did by looking at their monthly returns, how much their value changed, and their risk level. They didn't just review the portfolios' yearly performance; they also looked at their performance over many years. They wanted to see if the portfolios could perform well during both good and bad times in the stock market. They believe that the certainty equivalent return is a better way to measure a portfolio's performance than the Sharpe ratio, which compares extra earnings to risk. They also explored whether investing in a variety of companies helped earn more money and reduce risk. Their findings showed that the more diversified the investments were, the better they performed and the less risky they were.

'Modern Portfolio Theory' a celebrated theory in finance is given by Markowitz (1952), uses the 'mean-variance' computation and the landmark of the 'portfolio frontier'. This theory supports various important financial models such as the most 'Capital Asset Pricing Model', and other important theories like 'Arbitrage Pricing Theory' and the 'Efficient Market Hypothesis' etc. understanding above theories investors attempt to allocate their capital into diversified avenues and hence risk maximizes at given level of expected returns. In this process optimisation will be represented by efficient frontier. Clarke et al., 2006 unearthed a landmark point called the 'global minimum variance portfolio', now a component of the efficient frontier, unveiled noteworthy long-term returns. At this point there will be lowest risk measured in terms of smallest standard deviation. These discussions are fundamental to risk management.

Moreover, 'capital market line' a straight line connecting two points 'a' to 'b' (a = risk-free asset, point b = on the efficient frontier), and the intersection point signifies the tangency portfolio called market portfolio prescribes the 'optimal return for the given risk.

When the use of Markowitz's mean-variance approach for investing, it's important to figure out the average returns, the variances, and how different risky assets varies together (covariance). But because there are so many factors to consider and the calculation is difficult. To solve this, some studies suggest easier methods. For example, Sharpe's single-index model from 1963 simplifies things by comparing an asset's returns to the market's return. The expected return of an asset is calculated by taking a fixed value (alpha) and adding it to the product of the market's expected return and a factor (beta) from the model.

The Treynor and Black model from 1973 combines passive and active investments in a smart way. They use the single-index model to find the alpha and beta for the active investments. Then, they use these values to figure out the best mix of passive and active investments. Passive investments are often in portfolios that are either value-weighted or equal-

weighted. Studies show that using the Treynor and Black model can lead to better investment results than just active investing.

In their 2005 study, Robert et al. conducted a ranking of companies according to various metrics. They identified the top 1,000 companies for each specific metric. These companies were then incorporated into the index, with each company's weight in the index corresponding to its size relative to the particular metric. This process was used to establish the Fundamental index associated with each metric.

They developed a model that uses a fundamental index, which is based on six financial indicators to decide how much to invest in US companies. These were book value, trailing five-year average cash flow, trailing five-year average revenue, trailing five-year average gross sales, trailing five-year average gross dividends, and total employment.

William Sharpe (1966) developed the Sharpe ratio. Till date is the highly referred risk adjusted return measures. Walkshausl and Lobe in 2010 applied this model to 50 different countries' stock markets and found that the fi model usually did better than the market-value-weighted index. Pysarenko and team in 2019 suggest that you need different investment strategies for different economic conditions. When the market is doing well, you can use past stock returns to guess future returns, which fits with the global minimum variance method. But sometimes, looking at a company's basic financial indicators gives you a better idea of stock returns, so the fundamental index model works better. They came up with the predictive blends model, which combines global minimum variance and fundamental index methods and decides how much to invest based on the buffet indicator. Their research on the US stock market showed that the pb model does better over the long term than just using global minimum variance or fundamental index methods, and it also beats the overall market portfolio. Tobin's Q ratio and Treynor ratio are the important measures of market performance as well. These studies are unclear and inconclusive about the impact of financial technology on market performance and the second objective will enlighten the real effect. The following hypothesis has been formulated in the line with second objective and above discussion.

H2: *fintech has significant and positive impact on the market performance of financial services providers. (See the equation 2.)*

3.3 Operating efficiency of financial services providers and the fintech

FinTech leads the innovation in financial instruments and business transformation. It encompasses the use of technologies such as big data, intelligent algorithms, cloud computing, specialized software, and digital technology. Banks and other financial institutions leverage FinTech to automate, customize, and personalize their services, enhancing the quality of these services.

Digital finance has fostered greater financial inclusion (Ozili, 2018). It has impacted an organization's debt finance and alleviated financial constraints. FT has the potential to alleviated many ever-ending problems. The most was information asymmetry amongst different stakeholders e.g. interest rate comparison, also, helped in products and services innovations, enhance finance supply, increased competitiveness among service providers, and surpass spatiotemporal limitations. Also, FT has elevated the availability and accessibility of finance. On the other side it has reduced financing costs. But these problems are not yet fully finished challenges are also there or even emerged due to FT, such as the risk of illegal funds and financial fraud etc. Conventionally, banks have monopolised in financial services, but the past decade has seen a paradigm shift. Now TF is as good as these services provides or it is not wrong to say that they are even superior to banks evidenced from reduction in cost of financial intermediation and information asymmetry alleviation, tackling of adverse selection and moral hazards and in these services and many more. Moreover, FT will substitute or complement banks is a key question to see in near future (Dasilas & Karanović, 2023). These makes a grey area for research that is how FT influences banks. Since banks have to operate under stringent regulations, FT companies are free compare to banks from regulatory constraints, this allows them them to capitalize on these limitations. Researchers found that the regulatory disparity has negatively impacted bank profits, while boosting those of FT firms. FT comes with cutting edge technologies that disrupts traditional financial intermediation, additional snatch the profit of banks.

The researches (Megginson et al., 1994; Boubakri & Cosset, 1998; D'Souza & Megginson, 1999; D'Souza et al., 2005) have recorded significant improvements in output, operating efficiency, profitability and capital spending while the use of FT in multiple countries. What to use to measure for inputs and outputs is a debated topic among researchers. The production approach and intermediation approach are the two school of thought applicable to FSPs.

Some other researchers have used loans and other earnings assets as outputs and deposits and short-term funding, fixed assets and personnel expenses as inputs. I discovered conflicting

evidence regarding the relationship _between operating efficiency and fintech. Additionally, there is a significant lack of literature that clearly defines this relationship, particularly in the context of financial services providers. The third objective of this study aims to uncover this relationship. Therefore, the following hypothesis can be formulated based on the above discussion and will provide further clarity

H3: *fintech has significant and positive impact on the operating efficiency of financial services providers. (See the equation 3.)*

3.4 Technical efficiencies of financial services providers and the fintech

Efficiency quantifies the value of outputs generated from various inputs, serving as a metric for assessing corporate performance (Al-Darrab, 2000). Efficiency is determined when a company's output is at least equivalent to its input. In financial services providers (dubbed as FSPs) efficiency is gauged using two methods: the intermediation and production approaches. The production approach views the institution as a creator of savings and loan accounts, whereas the intermediation approach considers the institution's role in reallocating borrowed funds from areas of surplus to those with deficits (Ahmed, 2002; Amin, 2018).

Efficiency enhancement can be achieved through strategies like the consolidation of finance Institutions and the increase of profitability. However, the efficiency can be adversely affected by the issuance of smaller loans. The performance of FSP is impacted by the profit margin utilized. Technology can embrace the poor and financial sustainability of the FSPs Input-Output Specification in FSPs. From the above review of related literature, it is clear that financial service providers can be evaluated in terms of technical efficiency and hence, inefficiency. However, it is not clear how financial technology has impacted the technical efficiency of financial services. Therefore, the fourth objective of this study has been established. This study hypothesises as fintech has significant impact on it.

H4: *fintech has significant and positive impact on the technical efficiency of financial services providers. (See the equation 4.)*

4 HYPOTHESIS

H1: *fintech has significant and positive impact on the financial performance of financial services providers. (See the equation 1.)*

H2: *fintech has significant and positive impact on the market performance of financial services providers. (See the equation 2.)*

H3: *fintech has significant and positive impact on the operating efficiency of financial services providers. (See the equation 3).*

H4: *fintech has significant and positive impact on the technical efficiency of financial services providers. (see the equation 4)*

5 METHODOLOGY TO BE ADOPTED

This section will delineate the methodological framework that will be employed to investigate the impact of fintech on performance and efficiency of financial services providers. The research will adopt a quantitative technique to provide a comprehensive analysis. Secondary data will be sourced from existing literature, industry reports, and financial databases. The study will span from April 1, 2008, to the present. A panel data regression model will be employed.

5.1 Dependent variables for financial performance

Keisidou et al. (2013); Hallowell (1996); Scholtens and Dam, 2007; Finger et al. (2018); Nguyen (2012) and Evian et al. (2021) used of ROA_, ROE_ and NPM. But Anderson et al. (1994) used ROI_; Chi and Gursoy (2009) used ROI_, and net profit. Additionally, Hallowell (1996) utilized the ratio of non-interest expenses to total revenue. However, Nawaz (2019) applied ROA_ and ROE. Moreover, Net Interest Margin used by Scholtens and Dam (2007); Finger et al. (2018); Rashid et. al. (2020), found that there is no relationship _between customer loyalty and the financial performance of the Islamic banks.

In this study return on assets and the Net interest margin_ (i.e. Dietrich and Wanzenried, 2011; Dasilas, 2023; Shaban and James, 2018; Phan et al., 2020) will be used.

The capital adequacy ratio, Size -measured by total asset will be used. Capitalization is measure by total capital to total assets. Expense to total income, annual growth of deposits, Reserve to total assets. Total expense to total liability. Cash flow from operating activity_ to

total assets, Cash flow from investing activity_, Cash flow from financing activity_ as control variables. The variables have described about it in the Table 1. The financial performance has been dubbed as FINPERFO.

Table 1 Description of the variables

Variables	Definition
ROA	Profit after tax/ total assets
IITA	Interest income to total assets
CAR	Capital adequacy ratio (Tier 1 Capital + Tier 2 Capital / Risk Weighted Assets)
Size	Log of total assets (₹ million)
ETI	Expense to total income
CAPTA	Capital to total assets_
GRODEPO	Growth rate of deposits_
RTA	Reserve to total assets_
TETL	Total expense to total liability
COATA	Cash flow from operating activity_
CIATA	Cash flow from investing activity_
CFATA	Cash flow from finance activity_

Source(s): Authors

Equation 1 Impact of fintech on financial performance of financial services providers

$$FINPERFO_{it} = a + \beta_1 FinTechvo_{it} + \beta_2 FinTechva_{it} + \beta_3 CAR_{it} + \beta_4 IITA_{it} + \beta_5 SIZEit + \beta_6 ETIit + \beta_7 CAPTAit + \beta_8 GRODEPOit + \beta_9 RTAit + \beta_{10} TETLit + \beta_{11} COATAit + \beta_{12} CIATAit + \beta_{13} CFATAit + \varepsilon_{it} \quad \text{.....1}$$

5.2 Dependent variables for market performance

Hung et al. (2024) used expected return to measure return and variance and standard deviation as a measure of risk (Markowitz, 1952). The CAPM was introduced by Treynor (1961, 1962); Sharpe (1964); Lintner (1965) and Mossin (1966).

Robert (2005) uses a fundamental index, which is based on six financial indicators, book value, trailing five-year average cash flow, trailing five-year average revenue, trailing five-year average gross sales, trailing five-year average gross dividends, and total employment. Sharpe ratio. Treynor ratio. Tobin's Q ratio.

We will used expected return, risk (variance and standard deviation). CAPM. Sharpe ratio. Treynor ratio. Tobin's Q ratio to assess the market performance. And same independent variable and control variable will be used. Market performance is used as MAPERFO.

To find the impact of fintech on market performance of financial services providers following equation will be used.

Equation 2 Impact of fintech on market performance of financial services providers

$$MAPERFO_{it} = a + \beta_1 FinTechvo_{it} + \beta_2 FinTechva_{it} + \beta_3 CAR_{it} + \beta_4 IITA_{it} + \beta_5 SIZEit + \beta_6 ETIit + \beta_7 CAPTAit + \beta_8 GRODEPOit + \beta_9 RTAit + \beta_{10} TETLit + \beta_{11} COATAit + \beta_{12} CIATAit + \beta_{13} CFATAit + \varepsilon_{it} \quad \text{.....2}$$

5.3 Dependent variables for operating efficiency

Efficiency measured in terms of outputs generated from various inputs such as labour and materials, or their cost equivalents. Efficiency Ratio or the ratio of expenses to revenue is the important triggers to assess it. The Efficiency Ratio reveals that how much a financial services provider spends to earn every dollar of revenue. Efficiency Ratio of .65, means FSPs spends 65 paise to earn every rupee of revenue. Also, it can be calculated as follows: Non-interest expense_ divided by total revenue less interest expense; non-interest expense_ divided by net interest income before provision for loan losses; non-interest expense divided_ by revenue; Operating expenses divided by fee income plus tax-equivalent net interest income. Operating efficiency ratio. Operating profitability ratio. Return on capital employed. Return on owner's equity.

This study will use operating efficiency ratio (Eldomiaty et al., 2023; Luo et al., 2023), operating profitability ratio, return on capital employed, return on owner's equity to assess the operating efficiency. And the same independent variable and control variable will be used. Operating efficiency has been dubbed as OPEF.

Equation 3 Impact of fintech on operating efficiency of financial services providers

$$OPEF_{it} = a + \beta_1 FinTechvo_{it} + \beta_2 FinTechva_{it} + \beta_3 CAR_{it} + \beta_4 IITA_{it} + \beta_5 SIZEit + \beta_6 ETIit + \beta_7 CAPTAit + \beta_8 GRODEPOit + \beta_9 RTAit + \beta_{10} TETLit + \beta_{11} COATAit + \beta_{12} CIATAit + \beta_{13} CFATAit + \varepsilon_{it} \quad \text{.....3}$$

5.4 Dependent variables for technical efficiency

In the literatures the output was assessed in terms of investments, loans. The input was assessed in terms of financial funds, labour, physical capital. Similarly, output price was measured as price of investments, price of loans. And the input price was measured as price of financial funds, price of labour, price of physical capital. Revenue, cost, profit will give profitability that is profit/ cost (Chen et al., 2022).

In this study output price will be measured as price of investments, price of loans. And the input price will be measured as price of financial funds, price of labour, price of physical capital to assess the technical efficiency. And the same independent variable and control variable will be used. Technical efficiency is TECHEF

Equation 4 Impact of fintech on technical efficiency of financial services providers

$$TECHEF_{it} = a + \beta 1FinTechvo_{it} + \beta 2FinTechva_{it} + \beta 3CAR_{it} + \beta 4IITA_{it} + \beta_5 SIZEit + \beta 6ETIit + \beta 7CAPTAit + \beta 8GRODEPOit + \beta 9RTAit + \beta 10TETLit + \beta 11COATAit + \beta 12CIATAit + \beta 13CFATAit + \varepsilon_{it} \quad \text{.....4}$$

6 PROPOSED/EXPECTED OUTCOME OF THE RESEARCH

This research aims to demonstrate that advancements in financial technology significantly enhance/impede the performance and efficiency of financial service providers. The expected outcomes of this research have been elaborated upon in this section. F T will have a significant and positive impact on the financial performance of financial service providers. These innovations are expected to enhance profitability, as evidenced by improvements in return on assets (ROA) and return on equity (ROE) for these financial services providers (DeYoung et al., 2007; Onay et al., 2013; Orji et al., 2018; Mensah et al., 2019). But, Sathye (2005) has been asserted that financial innovation, specifically internet banking, does not significantly influence bank performance.

FinTech will significantly and positively impact the market performance of financial service providers. Additionally, FinTech will enhance the operating efficiency of these providers. Rashid et al. (2020) found that there is no relationship-between customer loyalty and the financial performance of the Islamic banks.

Additionally, the advancement of financial technology significantly enhances the technical efficiency of FSPs. The growth of financial technology steers the innovation trajectory and future prospects of financial institutions. A higher degree of financial technology correlates with increased investment in the financial sector and a stronger capacity for innovation, which can positively impact the profitability of FSPs (Zhao et at., 2024).

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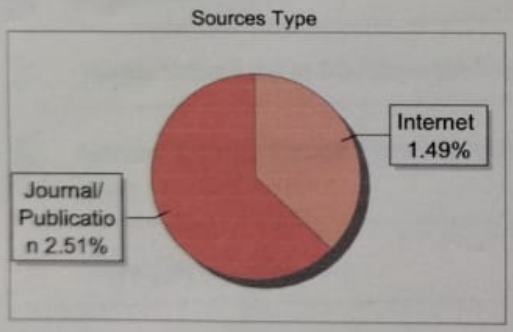

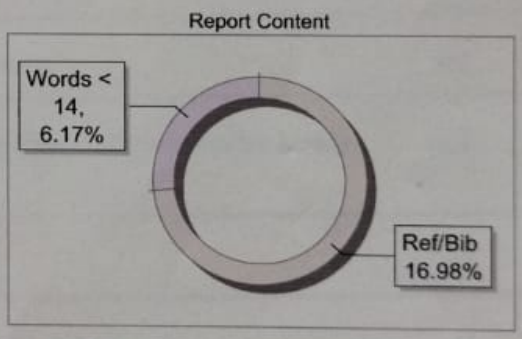

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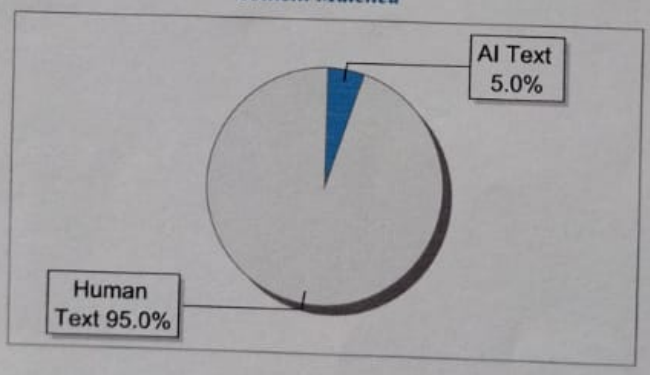

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